CLAIMS

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent is:

1. 1. A data processing apparatus selecting one of a plurality of candidate data
2. corresponding to watermark data embedded into object data to embed the selected
3. candidate data as said watermark data, comprising:
4.   a variation indication data generation means for generating a plurality of variation
5. indication data indicating variation between said object data and each of the object data
6. obtained by embedding each of said plurality of said candidate data;
7.   a detectability indication data generation means for generating a plurality of
8. detectability indication data each indicating how easily each of said plurality of candidate
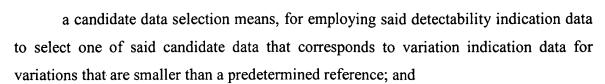9. data being detected;
10.   a watermark data selection means for selecting one of said candidate data based
11. on said plurality of variation indication data and said plurality of detectability indication
12. data; and
13.   a data embedding means for embedding the selected candidate data into said
14. object data as said watermark data.

1. 2. An image processing apparatus selecting one of a plurality of candidate data
2. corresponding to watermark data embedded into object image data to embed the selected
3. candidate data into said object image data as said watermark data, comprising:
4.   a variation indication data generation means for generating a plurality of variation
5. indication data indicating variation between said image data and each of the image data
6. obtained by embedding each of said plurality of said candidate data;
7.   a detectability indication data generation means for generating detectability
8. indication data each indicating how easily each of zero or more candidate data being
9. detected;

10   a candidate data selection means, for employing said detectability indication data

11 to select one of said candidate data that corresponds to variation indication data for

12 variations that are smaller than a predetermined reference; and

13   a data embedding means for embedding the selected candidate data as said

14 watermark data in said image data.

1 3.   The image processing apparatus according to claim 2, wherein said detectability

2 indication data generation means generates detectability indication data indicating the

3 detectability of said candidate data corresponding to said variation indication data

4 indicating variations smaller than said predetermined reference.

1 4.   The image processing apparatus according to claim 2, wherein, when no candidate

2 data corresponding to said variation indication data for variations smaller than said

3 predetermined reference exists, said candidate data selection means selects predetermined

4 supplement data, instead of said candidate data.

1 5.   The image processing apparatus according to claim 2, wherein each of said object

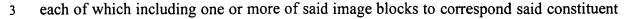2 image data is each of a plurality of image blocks obtained by dividing one image data set,

3 and

4   wherein each of said watermark data corresponding to each of said object image

5 data is each of one or more types of constituent data constituting additional information

6 that is added to said object image data,

7   said image processing apparatus further comprising:

8   a watermark data correspondence means for corresponding said constituent data

9 constituting said additional information data with said plurality of image blocks, as said

10 watermark data; and

11   a candidate data generation means for generating said plurality of candidate data

12 corresponding to said constituent data corresponded with said plurality of image block.

1 6. The image processing apparatus according to claim 5, wherein said watermark data
2 correspondence means accepts predetermined key data to correspond said constituent
3 data of said additional information data with said plurality of image blocks based on said
4 predetermined key data.

1 7. The image processing apparatus according to claim 5, wherein said candidate data
2 generation means generates, as said plurality of candidate data, a plurality of additional
3 patterns employing the same configuration as said object image data to be added to said
4 object image data.

1 8. The image processing apparatus according to claim 7, wherein said candidate data
2 generation means generates said plurality of additional patterns by multiplying a plurality
3 of predetermined coefficients with basic patterns corresponding to said constituent data
4 corresponded with said image blocks.

1 9. The image processing apparatus according to claim 8,
2 wherein said detectability indication data generation means calculates said
3 detectability indication data representing a correlation between said additional patterns
4 and said basic patterns; and
5 wherein said candidate data selection means selects, from among said additional
6 patterns, a pattern corresponding to detectability indication data representing the highest
7 correlation,
8 said image processing apparatus further comprising:
9 a watermark data detection means for detecting said watermark data embedded
10 into said image block, based on said correlation of said basic patterns and an image block
11 into which the selected additional pattern embedded.

1 10. The image processing apparatus according to claim 5, wherein said watermark data
2 correspondence means sorts said plurality of image blocks into one or more of groups,

3   each of which including one or more of said image blocks to correspond said constituent

4   data with said image blocks that are included in said groups.

1   11.   The image processing apparatus according to claim 2, wherein said variation

2   indication data generation means calculates each of differences between each of entropy

3   values for said object image data and each of entropy values for said object image data

4   obtained by embedding each of said plurality of candidate data as said variation

5   indication data.

1   12.   The image processing apparatus according to claim 2, wherein said detectability

2   indication data generation means generates said detectability indication data for said

3   respective candidate data corresponding to said variation indication data with their values

4   within a predetermined range.

1   13.   A data processing method, for selecting one of a plurality of candidate data

2   corresponding to watermark data embedded into object data for embedding the selected

3   candidate data as said watermark data, comprising:

4   a variation indication data generation step of generating a plurality of variation

5   indication data indicating variation between said object data and each of the object data

6   obtained by embedding each of said plurality of said candidate data;

7   a detectability indication data generation step of generating a plurality of

8   detectability indication data each indicating how easily each of said plurality of candidate

9   data being detected;

10   a watermark data selection step of selecting one of said candidate data based on

11   said plurality of variation indication data and said plurality of detectability indication

12   data; and

13   a data embedding step of embedding the selected candidate data into said object

14   data as said watermark data.

1 14. An image processing method, for selecting one of a plurality of candidate data

2 corresponding to watermark data embedded into object image data for embedding the

3 selected candidate data into said object image data as said watermark data, comprising:

4 a variation indication data generation step of generating a plurality of variation

5 indication data indicating variation between said image data and each of the image data

6 obtained by embedding each of said plurality of said candidate data;

7 a detectability indication data generation step of generating detectability

8 indication data each indicating how easily each of zero or more candidate data being

9 detected;

10 a candidate data selection step of employing said detectability indication data to

11 select one of said candidate data that corresponds to variation indication data for

12 variations that are smaller than a predetermined reference; and

13 a data embedding step of embedding the selected candidate data as said

14 watermark data in said image data.

1 15. A program storage device readable by a machine, tangibly embodying a program of

2 instructions executable by the machine to perform the method steps for selecting one of a

3 plurality of candidate data corresponding to watermark data embedded into object data to

4 embed the selected candidate data as said watermark data, said method steps comprising:

5 a variation indication data generation step of generating a plurality of variation

6 indication data indicating variation between said object data and each of the object data

7 obtained by embedding each of said plurality of said candidate data;

8 a detectability indication data generation step of generating a plurality of

9 detectability indication data each indicating how easily each of said plurality of candidate

10 data being detected;

11 a watermark data selection step of selecting one of said candidate data based on

12 said plurality of variation indication data and said plurality of detectability indication
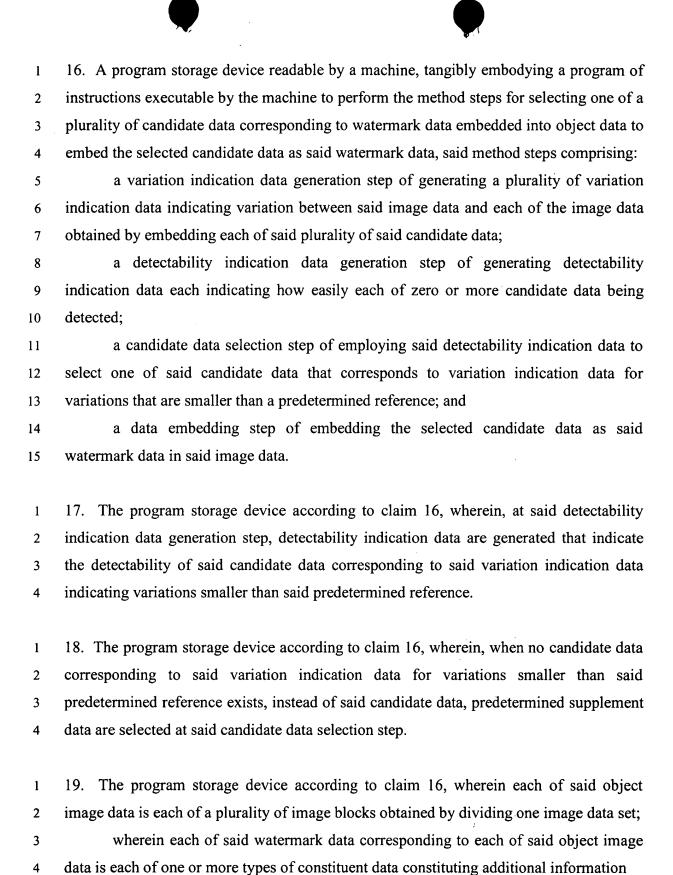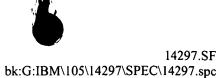
13 data; and

14 a data embedding step of embedding the selected candidate data into said object

15 data as said watermark data.

1   16. A program storage device readable by a machine, tangibly embodying a program of

2   instructions executable by the machine to perform the method steps for selecting one of a

3   plurality of candidate data corresponding to watermark data embedded into object data to

4   embed the selected candidate data as said watermark data, said method steps comprising:

5   a variation indication data generation step of generating a plurality of variation

6   indication data indicating variation between said image data and each of the image data

7   obtained by embedding each of said plurality of said candidate data;

8   a detectability indication data generation step of generating detectability

9   indication data each indicating how easily each of zero or more candidate data being

10   detected;

11   a candidate data selection step of employing said detectability indication data to

12   select one of said candidate data that corresponds to variation indication data for

13   variations that are smaller than a predetermined reference; and

14   a data embedding step of embedding the selected candidate data as said

15   watermark data in said image data.

1   17. The program storage device according to claim 16, wherein, at said detectability

2   indication data generation step, detectability indication data are generated that indicate

3   the detectability of said candidate data corresponding to said variation indication data

4   indicating variations smaller than said predetermined reference.

1   18. The program storage device according to claim 16, wherein, when no candidate data

2   corresponding to said variation indication data for variations smaller than said

3   predetermined reference exists, instead of said candidate data, predetermined supplement

4   data are selected at said candidate data selection step.

1   19. The program storage device according to claim 16, wherein each of said object

2   image data is each of a plurality of image blocks obtained by dividing one image data set;

3   wherein each of said watermark data corresponding to each of said object image

4   data is each of one or more types of constituent data constituting additional information

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6   that is added to said object image data; and

7   wherein said computer-readable program further comprises

8   a watermark data correspondence step of corresponding said constituent data

9   constituting said additional information data with said plurality of image blocks, as said

10   watermark data, and

11   a candidate data generation step of generating said plurality of candidate data

12   corresponding to said constituent data corresponded with said plurality of image block.

1   20. The program storage device according to claim 19, wherein, at said watermark data

2   correspondence step of accepting predetermined key data to correspond said constituent

3   data of said additional information data with said plurality of image blocks based on said

4   predetermined key data.

1   21. The program storage device according to claim 19, wherein, at said candidate data

2   generation step, a plurality of additional patterns employing the same configuration as

3   said object image data to be added to said object image data are generated as said

4   plurality of candidate data.

1   22. The program storage device according to claim 21,

2   wherein, at said detectability indication data generation step, said detectability

3   indication data are calculated representing a correlation between said additional patterns

4   and said basic patterns;

5   wherein, at said candidate data selection step, from a pattern corresponding to

6   detectability indication data representing the highest correlation is selected among said

7   additional patterns; and

8   wherein said computer-readable program further comprises

9   a watermark data detection step of detecting said watermark data embedded into

10   said image block, said correlation of said basic patterns and an image block into which

11   the selected additional pattern embedded.

1   23. The program storage device according to claim 22 wherein, at said detectability
2   indication data generation step, the products of said additional patterns, and
3   corresponding data that are included in said basic patterns, that correspond to said
4   additional pattern are calculated as said detectability indication data; and wherein, at said
5   candidate data selection step, said candidate data that correspond to the detectability
6   indication data of a maximum value are selected.

1   24. The program storage device according to claim 19, wherein, at said watermark data
2   correspondence step, said plurality of image blocks are sorted into one or more of groups,
3   each of which including one or more of said image blocks to correspond said constituent
4   data are corresponded with said image blocks that are included in said groups.

1   25. The program storage device according to claim 16, wherein, at said variation
2   indication data generation step, each of differences are calculated between each of
3   entropy values for said object image data and each of entropy values for said object
4   image data obtained by embedding each of said plurality of candidate data as said
5   variation indication data.

1   26. The program storage device according to claim 16, wherein, at said detectability
2   indication data generation step, said detectability indication data are generated for said
3   respective candidate data corresponding to said variation indication data with their values
4   within a predetermined range.